

REMARKS

The above amendments to the above-captioned application along with the following remarks are being submitted as a full and complete response to the Office Action dated December 4, 2007. In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Status of the Claims

As outlined above, claims 71, 73-82, and 142-150 stand for consideration in this application, wherein claims 72, 141, and 143 are being canceled without prejudice or disclaimer, while claims 71, 73, 75-78, 81, 142, and 145-148 are being amended. Claims 83-140 stand withdrawn from consideration in this application.

All amendments to the application are fully supported therein, including page 19, lines 6-25 of the specification. Applicants hereby submit that no new matter is being introduced into the application through the submission of this response.

Formal Objections

Specification

The Examiner asserted the amendment filed August 31, 2007, particularly with respect to the terms "the spin analyzer including an corrector", was objected to under 35 U.S.C. §132(a).

As mentioned above, claim 71 is being amended so as to meet the requirements under 35 U.S.C. §132(a). Accordingly, withdrawal of this objection is respectfully requested.

Claim

The Examiner asserted that should claim 142 be found allowable, claim 143 will be objected to under 37 C.F.R. §1.75 as being a substantial duplicate thereof.

Claim 143 is being canceled, and therefore, this objection is moot. Accordingly, withdrawal of this objection is respectfully requested.

Formal Rejections

35 U.S.C. §112, first paragraph, Rejection

Claims 71-80 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement.

As pointed out by the Examiner, claim 71 is being amended so as to meet the requirements under 35 U.S.C. §112, first paragraph. Accordingly, withdrawal of this rejection is respectfully requested.

35 U.S.C. §112, second paragraph, Rejection

Each of claims 71-82 and 141-150 was rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As mentioned above, claims 72 and 141 are being canceled, and claims 71, 73, 143 are being amended so as to meet the requirements under 35 U.S.C. §112, second paragraph. Accordingly, withdrawal of these rejections is respectfully requested.

Prior Art Rejections

35 U.S.C. §102(b) Rejection

Each of claims 71-81 and 141-150 were rejected under 35 U.S.C. §102(b) as being anticipated by Gregg et al. (WO 01/69655). As mentioned above, claims 72, 141, and 143 are being cancelled, and therefore, the rejections against claims 72, 141, and 143 are moot. Applicants respectfully traverse these rejections for the reasons set forth below.

According to the M.P.E.P. §2131, a claim is anticipated under 35 U.S.C. §102 (a), (b), and (e) only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.

Claim 71

Claim 71 as amended recites that a transistor, comprises: a spin injector for injecting spin-polarized hot carriers by a spin-filter effect, the spin injector including an emitter; a spin analyzer for selecting the thus injected spin-polarized hot carriers by the spin-filter effect, the spin analyzer including a collector; and a second nonmagnetic electrode layer having a thickness such that the carriers injected from the spin injector pass through said second nonmagnetic electrode layer as hot carriers, one end surface of said second nonmagnetic

electrode layer being joined to one end surface of said spin injector, and the other end surface of said second nonmagnetic electrode layer being joined to one end surface of said spin analyzer, wherein said spin injector comprises: a first ferromagnetic barrier layer having a thickness that allows the carriers to be transported by tunneling upon application of a voltage across said first ferromagnetic barrier layer and having a band edge that is higher than a band edge of said second nonmagnetic electrode layer, one end surface of said first ferromagnetic barrier layer being joined to said one end surface of said second nonmagnetic electrode layer; and a first nonmagnetic electrode layer joined to the other end surface of said first ferromagnetic barrier layer.

Fig. 1(A) illustrates a diagram of an exemplary structure of a transistor as recited in claim 71. Fig. 1(B) illustrates an energy band diagram of conduction bands of the structure shown in Fig. 1(A). Fig. 2(A) illustrates an energy band diagram when base ground bias voltages between an emitter, a base, and a collector of the transistor as recited in claim 71 are applied. As shown in Fig. 2(A), a second nonmagnetic electrode layer 4 has a thickness such that the carriers injected from the spin injector pass through said second nonmagnetic electrode layer as hot carriers (page 19, lines 6-17 of the specification). Also, as shown in Fig. 1(B), a first ferromagnetic barrier layer 2 has a thickness that allows the carriers to be transported by tunneling upon application of a voltage across said first ferromagnetic barrier layer and has a band edge that is higher than a band edge of said second nonmagnetic electrode layer 4 (page 19, lines 18-25 of the specification).

In contrast, Gregg shows that a thickness of an aluminum layer 170 is 1 micron (page 12, line 30). Applicants respectfully submit that one of ordinary skill in the art would have understood that such a thickness does not allow the carriers to pass through the aluminum layer as hot carriers. Furthermore, Gregg shows that the thickness of a cobalt layer is 30 nm. Applicants respectfully submit that one of ordinary skill in the art would have understood such a thickness does not allow the carriers to be transported by tunneling upon application of a voltage across the cobalt layer and does not have a band edge that is higher than a band edge of the aluminum layer. Therefore, Gregg does not show or suggest explicitly or implicitly that a second nonmagnetic electrode layer has a thickness such that the carriers injected from the spin injector pass through said second nonmagnetic electrode layer as hot carriers and a first ferromagnetic barrier layer has a thickness that allows the carriers to be transported by tunneling upon application of a voltage across said first ferromagnetic barrier

layer and has a band edge that is higher than a band edge of said second nonmagnetic electrode layer.

As such, Gregg does not show every element recited in claim 71. Accordingly, claim 71 is not anticipated by Gregg.

Claim 81

Claim 81 has substantially the same features as those of claim 71, at least with respect to a second nonmagnetic electrode layer having a thickness such that the carriers injected from the spin injector pass through said second nonmagnetic electrode layer as hot carriers, and a first ferromagnetic barrier layer having a thickness that allows the carriers to be transported by tunneling upon application of a voltage across said first ferromagnetic barrier layer and has a band edge that is higher than a band edge of said second nonmagnetic electrode layer. As such, the arguments set forth above are equally applicable here. Claim 71 being allowable, claim 81 must also be allowable.

Claims 73-80, 142-150

As to dependent claims 73-80 and 142-150, the arguments set forth above with respect to independent claims 71 and 81 are equally applicable here. The corresponding base claim being allowable, claims 73-80 and 142-150 must also be allowable.

35 U.S.C. §103(a) Rejection

Claim 82 was rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over Gregg in view of Noguchi et al. (U.S. Publication No. 2003/0013843). This rejection is respectfully traversed for the reasons set forth below.

As set forth above, Gregg fails to teach all the elements recited in claim 81, from which claim 82 depends. The secondary reference of Noguchi fails to provide any disclosure, teaching or suggestion that makes up for the deficiencies in Gregg. Therefore, at the time the invention was made, one of ordinary skill in the art would and could not achieve all the features as recited in claim 81, from which claim 82 depends. Accordingly, claim 82 is not obvious in view of all the prior art cited.

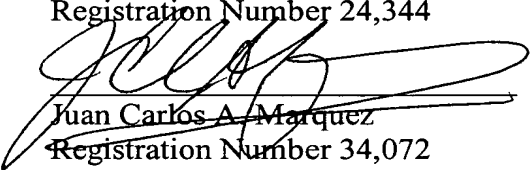
Conclusion

In light of the Amendments and Remarks, Applicants respectfully request early and favorable action with regard to the present application, and a Notice of Allowance for all pending claims is earnestly solicited.

Favorable reconsideration of this application as amended is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicants' undersigned representative at the address and phone number indicated below.

Respectfully submitted,

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